

## RELATIONSHIP BETWEEN PERCEPTUAL STABILITY AND SIGHTING DOMINANCE<sup>1</sup>

VEZIO RUGGIERI, DAVIDE CERIDONO, CHIARA BERGERONE,  
AND ALBERTO CEI

*University of Rome*

*Summary.*—A study was made of perceptual stability (in binocular, right and left monocular vision) and sighting dominance. 47 female psychology students served as subjects. The intention was to verify: (1) the hypothesis of asymmetry between the two eyes in the duration of the retinal image, which is indicative of sensory dominance; (2) the existence of a relationship between the two forms of dominance. The results seem to confirm the first hypothesis. Other relationships between sighting dominance and stability of image emerged. There was a positive correlation between sighting dominance and perceptual stability in binocular vision. There appear to be significant differences in perceptual stability depending on whether subjects show right, left, or no dominance.

In research on visual perception it has been observed that the image of a line on the retina disappears rapidly (5). One can obtain the same effect by presenting luminous figures in a dark room or black line figures in a globally illuminated field. Since a contact lens, designed with a placket that moves solidly over the eye, has been used in experiments, this phenomenon has been attributed to retinal stimulation exclusively.

We felt that a systematic study of the time which elapses between the presentation of a visual stimulus and the beginning of the distortion or the disappearance of the perceptual image was useful, particularly in a more natural situation in which the eye is free. Considering cerebral dominance in a larger sense, this phenomenon could present behavioral asymmetries between the two eyes. Thus, the duration of the perceptual stability of the image could be considered as a form of sensory dominance. Sensory dominance has been studied principally in situations of binocular rivalry (the figures presented to the two eyes are discrepant and cannot be fused stereoscopically). In this case the dominant eye is that which holds the image for the longer period of time (1, 2, 6, 7, 9). Thus, we hypothesize that the dominant eye presents greater perceptual stability and that difference in persistence of the right and left images can be a measure of the level of lateralization.

In a previous study of sighting dominance, the authors (8) identified the presence of at least three possible types of behavior (right-dominant, left-dominant, non-dominant). This differentiation was arrived at using a modified version of the alignment test (3, 4) which quantifies ocular dominance. In the present investigation we set out to verify whether or not the duration or

<sup>1</sup>Reprint requests should be sent to Dott. Vezio Ruggieri, Via Bisagno 28, Rome, Italy.

stability of the retinal image presents an asymmetry between the two eyes in relation to a sensory lateralization phenomenon and whether there is a relationship between this hypothesized form of sensory dominance and sighting dominance.

#### METHOD

The sample of 47 female undergraduate students in psychology ranged in age from 19 to 27 yr. All subjects had 10/10 visual acuity, with or without correction.

On the test of perceptual stability, each subject looked into a black box (112 cm.  $\times$  38 cm.  $\times$  33 cm.) with the head fixed in a headrest. She was shown a luminous rod positioned 112 cm. away. Measurement of the duration of the perception was carried out by means of an electronic timer with two buttons; one was positioned close to the experimenter (starter) and the other close to the subject (stop).

In the test of sighting dominance the subject again looked into the black box with the head fixed in a headrest. She was shown two luminous rods, one stationary at 112 cm. and the other mobile, placed at a distance of 45 cm. The subject could move the mobile rod on either side of a horizontal plane. The degree of shifting was read on a scale in centimeters.

On the test of sighting dominance the subject's task was to superimpose the mobile rod on the rod fixed on the background. This was first carried out using binocular vision. The subject then closed her left eye and corrected the position of the mobile rod, re-superimposing it over the fixed rod. The subject made these adjustments with the use of a lever. The score of sighting dominance was the difference between the left and the right eye scores. This last score was the algebraic difference in millimeters between binocular and monocular alignments obtained for each eye separately. Four trials were given each subject on this test.

On the test of perceptual stability the subject first looked into the apparatus with both eyes and then using left and right monocular vision. The subject's task was to look at the stationary rod on the background and to push a button when the rod seemed to be confused or to disappear.

There was a 30-sec. rest between trials, during which the subject kept her eyes closed. Perceptual stability was the duration of fixation time calculated in seconds. The maximum time set for each sequence was 120 sec. Three trials on this test were given each subject.

#### RESULTS AND DISCUSSION

Means and standard deviations for scores of perceptual stability were obtained; for binocular vision  $M = 62.91$  and  $SD = 44.04$ ; for right monocular vision  $M = 60.72$  and  $SD = 45.95$ ; for left monocular vision  $M = 48.36$  and  $SD = 39.63$ .

The three scores are significantly correlated: for binocular and right vision  $r = 0.72$  ( $df = 45, p < 0.01$ ); for binocular and left vision  $r = 0.48$  ( $df = 45, p < 0.01$ ); for right and left vision  $r = 0.73$  ( $df = 45, p < 0.01$ ). A comparison of correlated mean scores by  $t$  tests showed: (1) that there is no significant difference between perceptual stability for binocular and right monocular vision ( $t = 0.45, df = 45, p > 0.01$ ), (2) that there are significant differences between binocular and left monocular vision ( $t = 2.33, df = 45, p < 0.02$ ), and (3) that between right and left monocular vision perceptual stability is greater for the right side ( $t = 2.66, df = 45, p < 0.01$ ).

Differences between scores for right and left perceptual stability vary from subject to subject. In this group the difference is near zero for 21% of the subjects, greater than zero (right dominant) for 46% of the subjects, and less than zero (left dominant) for 31% of the subjects. The correlation between this difference and the scores of sighting dominance is not statistically significant ( $r = 0.13, p > 0.01$ ).

The sighting dominance test has a mean value of 1.18 and  $SD$  of 2.59. Following the criterion used by Ruggieri, *et al.* (8), the subjects were divided into three groups: right-dominant ( $M = 3.37, SD = 0.20$ ), left-dominant ( $M = -3.02, SD = 0.54$ ), non-dominant ( $M = 0.36, SD = 0.54$ ).

TABLE 1  
ANALYSIS OF VARIANCE, MEANS AND STANDARD DEVIATIONS OF PERCEPTUAL STABILITY IN BINOCULAR AND MONOCULAR VISION FOR THREE GROUPS ON SIGHTING DOMINANCE

Group	n	Binocular Vision		Right Vision		Left Vision	
		M	SD	M	SD	M	SD
Right dominance	21	80.79	42.2	73.16	44.1	54.20	38.9
No dominance	10	36.53	30.3	34.54	38.6	22.38	16.8
Left dominance	46	54.21	46.8	64.96	49.0	68.15	47.6
<i>F</i> ., <i>p</i>		5.34, < 0.01		3.33 < 0.05		5.04 < 0.05	

For scores of perceptual stability and sighting dominance there emerges a positive correlation between persistence in binocular vision and sighting dominance ( $r = 0.31, df = 45, p < 0.01$ ). The correlations between sighting dominance and perceptual stability in right monocular vision ( $r = 0.16, df = 45, p > 0.01$ ) and left monocular vision ( $r = 0.03, df = 45, p > 0.01$ ) are not significant. For the scoring criterion of sighting dominance see Ruggieri, *et al.* (8). We compared the perceptual stability scores obtained in the three different conditions (binocular, right and left monocular vision) for all subjects on the basis of sighting dominance in the three previously described groups. Their relative differences were statistically significant (Table 1).

On the basis of our results there are clear differences between the two eyes in perceptual stability (sensory dominance). While there are no significant differences between binocular and right monocular vision, differences appear in a comparison between right and left monocular vision and between binocular and left monocular vision. It is our opinion that such a difference in duration of perception indicates hemispheric dominance. The different types of sensory dominance discussed showed a trend similar to that obtained by other authors in tests of binocular rivalry (1, 2, 6, 7, 9).

A positive correlation occurs between perceptual stability scores in binocular vision and sighting dominance. These data indicate that there is a direct relationship between right-eye sighting dominance and a greater capacity to preserve a sensory image. Such a relationship refers only to binocular vision because correlations between the other conditions are nonsignificant. Another interesting result emerged as well: subjects who show a marked right-eye superiority in sighting dominance can be differentiated statistically significantly from subjects who show a left-eye dominance or no dominance in scores of perceptual stability. This difference is present in all three of the perceptual conditions examined. We wish to point out that the subjects with right monocular dominance have higher perceptual stability scores for binocular and right monocular vision. Subjects with left ocular dominance show higher scores for left monocular vision than the others. We would like to point out that the subjects showing no dominance always have lower perceptual stability scores.

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